

CAGE REARING OF EARLY JUVENILES OF WHITE PRAWN *PENAEUS INDICUS* (H. MILNE EDWARDS) FOR STOCKING IN GROW OUT NET PENS

ABSTRACT

The shrimps were grown in net pens at Killai from 1982. The pens were enclosed by using nylon webbing (14 mm and 10 mm stretched mesh size) at Killai. The shrimp larvae had to be grown to stockable size (1.7 to 3.0 g) to avoid escape through the mesh. The velon cages (16 p mesh HDPE) of $10 \times 4 \times 1.5$ m and $10 \times 3 \times 1.5$ m size were used for rearing shrimp larvae to juvenile size. The *Penaeus indicus* seeds were available in plenty in Killai Backwaters during June-August and December-February every year. These seeds were collected by push net and stocked in cages for rearing. The seeds were stocked at different stocking densities (1.125, 1.0, 0.83 and 0.25 million/ha) and better survival was recorded at 1.0 million/ha. stocking density. Three types of feed were given (1) Shrimp head, Boiled rice bran, Groundnut cake and squid pellet, (2) Shrimp head, squid pellet, crab, squilla and groundnut cake and (3) Boiled squid offal only. Among these three feed compositions, the boiled squid offal gave better conversion (3.85) at 1.0 million stocking density by feeding the seeds at 100% initial body weight. Very high feeding rate (200%, 175%, 250% initial body weight) gave poor survival and low conversion. The second type feed was given at 70% initial body weight, which took longer period for growing to stockable size. The boiled squid offal was given at 300% initial body weight in one cage with low stocking density (0.25 million/ha.) gave better survival in short period, but low conversion.

CULTURE of finfishes and shellfishes in enclosures has occupied important place in recent years with advancement of aquaculture techniques. The possible high stocking density; better management and complete harvest have attracted the attention of aquaculturists for adopting this aquaculture system. Floating net cages in deeper waters and fixed cages in shallow waters are used for rearing early stages and as well as grow out systems. Experimental rearings of carp spawn have been done in Tamil Nadu (Menon, 1983; Nalluchinnappan, 1983; Nalluchinnappan and Prabakara Raj, 1983, 1984) and successful rearing of shrimp juveniles in cages in Kovalam Backwaters, Tamil

Nadu has been carried out by Krishnan *et al.* (1983) and Rajendran and Siddharaj (1980). Pen-culture of penaeid shrimps practised in brackish-water areas of Killai (Tamil Nadu) since 1982. Complete removal of predatory fishes and pests from the pens is not possible owing to the auto entry of them through net enclosures and the left over of larger prawns and fishes after the previous stock is harvested, prey upon the smaller juvenile prawns stocked. Our experiences during the last five years revealed that to get better survival in the pens stocking of larger grown shrimp juveniles are preferable over the conventional early juvenile prawn (25-30 mm in size) as being done in the pond

rearing. Early juveniles of white prawn *Penaeus indicus* could be collected by using push nets from the local backwater (Karim and Bose, 1985). These early juveniles were reared in fixed cages for stocking in the growout net pens, the results of the experimental rearing is discussed in this paper.

Materials and methods

High density polypropylene (HDPP) cages of $10 \times 4 \times 1.5$ m size and $10 \times 3 \times 1.5$ m size cages were used in the present rearing. The bottom portion of the net was fixed into the soil, using stick anchors along the sides of the cages. The nets were tied to casurina posts and cross bars to keep them in position. In order to remove the accumulated silt inside the cage which led to the mortality of the juveniles at the time of harvest, the bottom of the cage velon material was replaced in 2×2 m area by nylon webbing of 10 mm mesh size, facilitating the seiving of accumulated silt at the time of seed removal. The early juvenile of *P. indicus* in the size ranging from 25-33 mm in TL and 0.025 to 0.30 gm in weight (with an average size of 28.80 mm in TL and 0.25 gm in weight) collected from the local nursery grounds were transported using round tin carriers and used for the rearing in all the experiments.

Six sets, totally 44 trials of rearing experiments were attempted. Three sets (13 trials) during June-August 1985, one set of 9 trials during December 85—January 86 and two sets (22 trials) during June-August 86. The early juveniles were stocked in the cages in different stocking densities. The stock was fed with different types of feed, to evolve suitable stocking density and feed for cage rearing of early juvenile of *P. indicus*.

The details regarding the rearing such as stocking density, feeding rate, feed given, size etc., are presented in the Table 1. The data given in the Table are of pooled and average of each set of experiments carried out.

Results

In the 1st set of experiment the stocking density was 4500 nos. of early juveniles (at 1.25 million/ha). in each of 40 m^2 cage. The stock was fed with supplementary diet prepared from shrimp head waste, boiled rice bran, groundnut cake and squid pellet. Feeding rate was at 200% of the body weight of initial weight of the stock. After an average rearing period of 25 days a mean survival rate of 68.5% was obtained. By the time the size of the prawn was 65.75 mm TL and 1.76 gm in weight. The conversion ratio for the feed worked out to 1 : 12.487.

4000 nos early juveniles of *P. indicus* were stocked in each 40 m^2 cage (at 1.0 million/ha). in the second set of experiments. The average rearing period was 28 days and the stock was fed with the same feed as that of first set of experiment. The feeding rate was 175% of the initial body weight of the stock. An average survival rate of 54.4% was obtained and the prawn attained an average size of 65.47 mm in TL and 1.74 gm in weight. The conversion rates was 1 : 8.044 for the feed given.

The third set of rearing experiments (3 trials) were carried out with 2500 nos of early juveniles stocking density per each 30 m^2 cage (At 0.83 million/ha.) and reared for an average period of 24 days. At the time of harvest the average size of the prawn was 66.06 mm in TL and 1.77 gm in weight. The survival rate was 52.5%. The feed was the same as that was used in the 1st and 2nd set of experiments. The feeding rate was 250% of the initial body weight of the stock. A conversion ratio of 1 : 22.318 was obtained in this experiment.

During December 85 to January 86 the fourth experiments were done (9 trials). Each cage of 40 m^2 area was stocked with 4,000 nos (at 1.0 million/ha.) of early juveniles. The stock was reared for an average period of 41 days. The feed used was prepared from shrimp head waste, squid pellet, crab and

squilla, groundnut cake at 100% of the initial body weight of the stock. During this period an average survival rate of 72.2% was obtained and the juveniles grew to average size of 65.40 mm in TL and 2.0 gm in weight. The feed conversion ratio was 1:6.125 for this feed.

body weight of the stock. The average size of the prawn at the time of harvest was 53.22 mm in TL and 2.52 gm in weight. The average survival rate was 83.10%. The conversion ratio for the feed given was 1:3.85.

TABLE 1. Rearing of *P. indicus* larvae in velon cages at Killal during 1985-86

No. of cages	3	7	3	9	21	1
Cage size m ²	40	40	30	40	40	40
Total No. stocked	13,500	28,000	7,500	36,000	84,000	1,000
Density per ha (in million)	1.125	1.0	0.83	1.0	1.0	0.25
Total no. recovered	9,252	15,241	3,940	26,000	69,818	750
% of recovery	68.5	54.4	52.5	72.2	83.1	75.0
Date of stocking	29.6.85— 9.7.85	1.7.85— 6.7.85	7.7.85— 8.7.85	10.12.85— 20.12.85	24.6.86— 10.7.86	15.7.86
Date of harvest	25.7.85— 2.8.85	25.7.85— 2.8.85	2.8.85	21.1.86— 26.1.86	23.7.86— 1.8.86	1.8.86
Duration of rearing (range days)	23—26	24—31	24—25	37—42	23—33	16
Ave. rearing days	25	28	24	41	27	16
Ave. initial length(mm)/wt/(gm)	28.8/0.25	28.8/0.25	28.8/0.25	28.8/0.25	28.8/0.25	28.8/0.25
Ave. final length (mm)/wt/(gm)	65.75/1.76	65.47/1.74	66.06/1.77	65.4/2.0	53.2/2.52	65.0/3.0
Initial total wt (kg)	3.250	7.000	1.875	9.000	21.000	0.300
Final total wt (kg)	16.303	26.519	6.974	51.650	177.861	2.50
Total wt gained (kg)	13.053	19.519	5.099	42.650	156.861	1.950
Total feed given (kg)	163,000	352,200	113,800	261,130	604,250	14,400
Conversion	12.487	18.044	22.318	6.123	3.85	7.38
% of feed given	200%	175%	250%	70%	100%	300%

The Vth set rearing experiments (21 trials) of early *P. indicus* juveniles were carried out at 4,000 nos per each 40 m² cage size (1.0 million/ha). during June-August 86. The juveniles were reared for 27 days and the stock was fed with boiled squid offal at 100% of the initial

A low stocking density rearing at 1000 Nos for 40 m² cage (at 0.25 million/ha) was done in the sixth rearing experiment during July-August 86. Higher feeding rate of 300% of the initial body weight was given to the stock. In this experiment the average survival

rate was 75.0% for 16 days rearing period. The shrimp juveniles attained an average size of 65.0 mm TL and 3.0 gm in weight. The conversion ratio of 1 : 7.38 % was recorded for the boiled squid offal feed given.

Discussion

The survival rate was above 70% in all the cages at 1 million/ha. density with shrimp head as major food item, resulting a conversion of 6.12. However, the growth was slow and the rearing period had to be prolonged more than 40 days. Similar observation was made during 1982-85 at Killai, when the rearing was beyond 40 days where poor survival was obtained (Bose and Nalluchinnappan, MS). The survival was poor in cages when the prawns were heavily fed (175, 200, 250 per cent initial body weight), but the growth was faster in shorter duration in those experiments. It may be due to heavy accumulation of unused feed and metabolic wastes at the bottom of the cages. At feeding 70% body weight the growth was slow in the fourth experiment. But increasing the rate of feeding to 100% body weight with same feed, the growth was better in 36 days (Bose and Nalluchinnappan, MS). Better growth conversion and survival were recorded with boiled squid offal as feed at 100% of

initial body weight in 27 days. Similarly better growth conversion with lower rate of survival was reported which might be due to prolonged rearing (50 days duration) (Bose and Nalluchinnappan, MS). Higher feeding rate (300% of body weight) with boiled squid offal gave better growth, lower conversion and lesser survival in the sixth set experiment which may be due excess accumulation metabolic waste and unutilised feed.

The boiled squid offal as feed gave better result in the stocking density at 1 million/ha. in cage rearing of *P. indicus* early juveniles. In the cages the harvest is complete, pest interference is less when compared to rearing seeds in pens. The shrimp head feed at 100% initial body weight gave good growth in 30-35 days period, less feeding with this feed results in poor growth, needs more duration for rearing, which in turn affect the rearing period in the pens. Feeding with boiled squid offal with lesser stocking density of *P. indicus* early juveniles also gave better growth, but the lesser density stocking will require more cages for rearing more seeds which may increase capital cost. Therefore, 1 million/ha stocking density can be considered for cage rearing of *P. indicus* early juveniles to stockable size in pens.

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